

The Initial Clinical Application of Arterial Spin Labeling Perfusion MRI in Prostate Cancer

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Introduction

Pulsed arterial spin labeling (PASL) MRI is a non-invasive imaging tool capable of quantitatively measuring the microvascular perfusion characteristics of tissue through tagging arterial water to obtain the blood flow (BF) map [1,2]. The PASL method has been proved to be effective and repeatable in many studies about cerebral diseases [2-4]. But the inversion time is an important influence factor for the absolutely quantitative interpretation [5,6]. Prostate cancer is a hypervascular tumor certificated by dynamic contrast-enhanced (DCE) MRI and histopathologic findings [7,8]. Therefore, in this study we applied the PASL technique to detect the prostate cancer and to compare the differences blood flow values between the malignant and normal prostate peripheral zones.

Methods

The local ethics committee approved the study and six patients (mean 78±3 years; range 74-82 years) with pathologically confirmed prostate cancer were recruited. All patients had elevated serum prostate-specific antigen (PSA) level (mean 117.9±106.8 ng/mL, range 11.41-294.8 ng/mL). The PASL pulse sequence was performed on a clinical 3.0T MR scanner (Signa HD; GE Healthcare, Milwaukee, Wisconsin). The PASL protocol was performed with single shot fast spin echo (SSFSE) sequence (TI 1000/1200/1400/1600 msec; TR 3500 ms; TR_{M0} 6000 ms; phases 8). The regions of interest (ROIs) were placed in the cancerous and noncancerous prostate peripheral zone, and the average BF in these regions for each patient was computed respectively.

Results

The mean BFs determined by PASL MRI with different TI in the prostate cancer were significantly higher than those in noncancerous regions (P<0.05, Paired T-test) (Table 1, Figure 1).

TI (msec)	Cancer BF (ml/100g/min)	Non-cancer BF (ml/100g/min)	P value
1000	106.4±30.96	37.43±8.53	.0045
1200	111.1±34.30	38.19±9.99	.0023
1400	102.9±30.55	32.40±8.96	.0027
1600	105.3±31.64	43.05±8.70	.0024

Table 1. Results of comparison of perfusion parameter (BF) between cancerous and noncancerous peripheral zone of prostate.

Discussion

This study demonstrates that PASL sequence can be used to evaluate the difference of BF value between cancer and noncancerous tissue in prostate. The higher BF in the cancerous region indicates hypervascular property of the prostate carcinoma, which is consistent with previous findings based on the pathology and DCE-MRI. It is a new imaging method with potency in detecting, staging and monitoring therapy efficacy of prostate cancer.

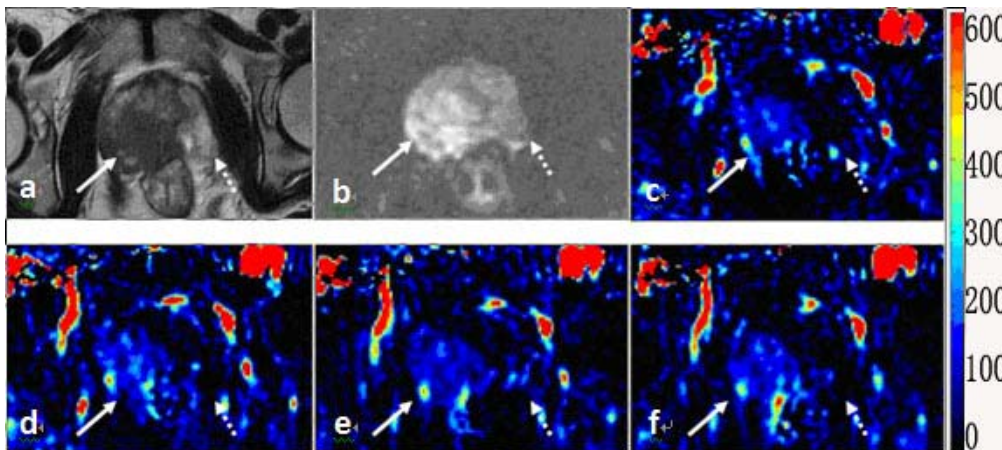


Figure 1. (a-b) A 77-year-old man with biopsy proven cancer at right peripheral zone. The cancer showed low signal in T2 and high signal in DWI; (c-f) The corresponding BF mappings with different TI.

References

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